HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

7030 Ryburn Dr. Millington, TN Phone: (901) 873-5300 Fax: (901) 873-5301 www.gohispeed.com

December 20, 2023

Shawna Guffey
Arkema
Memphis, TN

The following is a summary of findings from the December 2023 WEEK 2 vibration survey at the H2O2 Plant that was performed on December 15, 2023.

QualiTest® uses a four step rating system for defects.

CLASS I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

CLASS II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

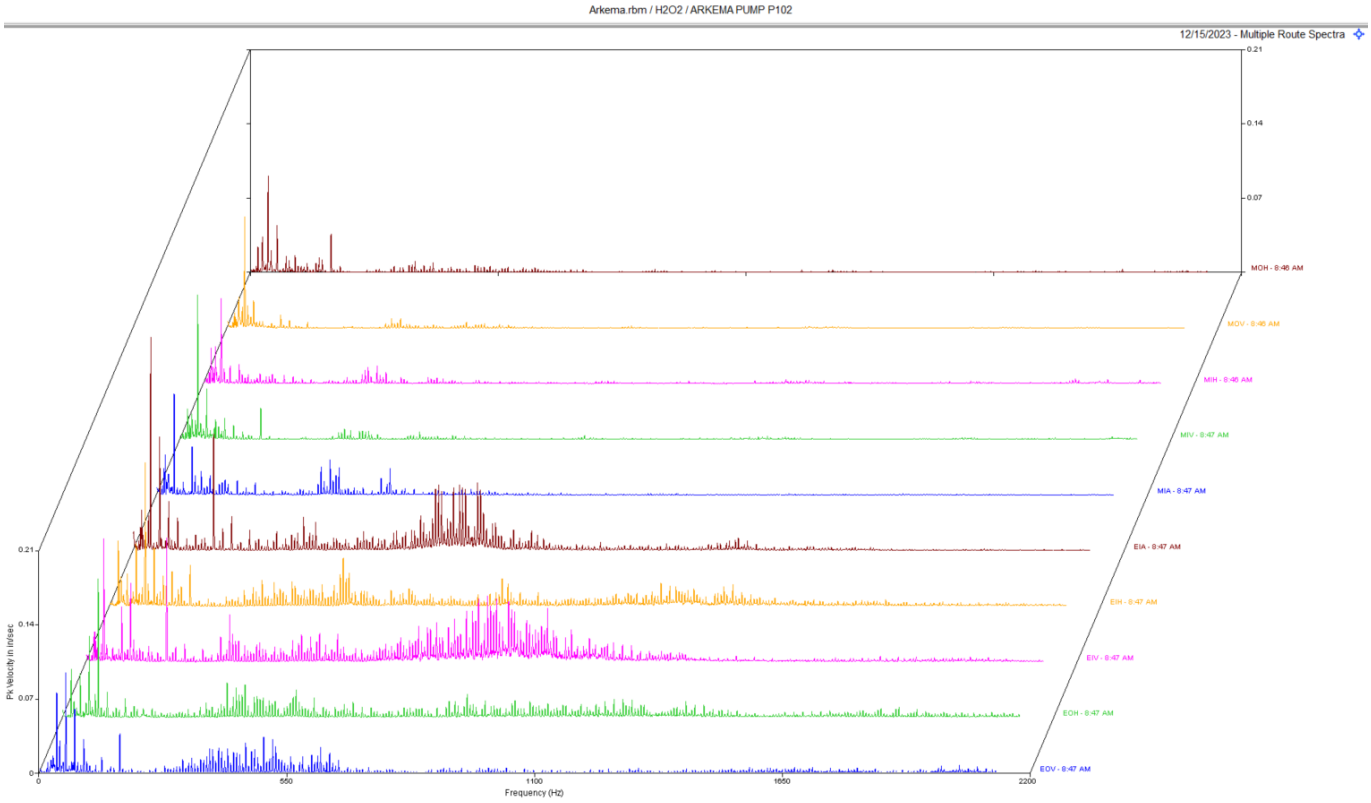
CLASS III: Defect (s) present that may cause failure in short term (less than 2 months). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

CLASS IV: Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs

Defect Summary

WEEK 2 H2O2 Plant

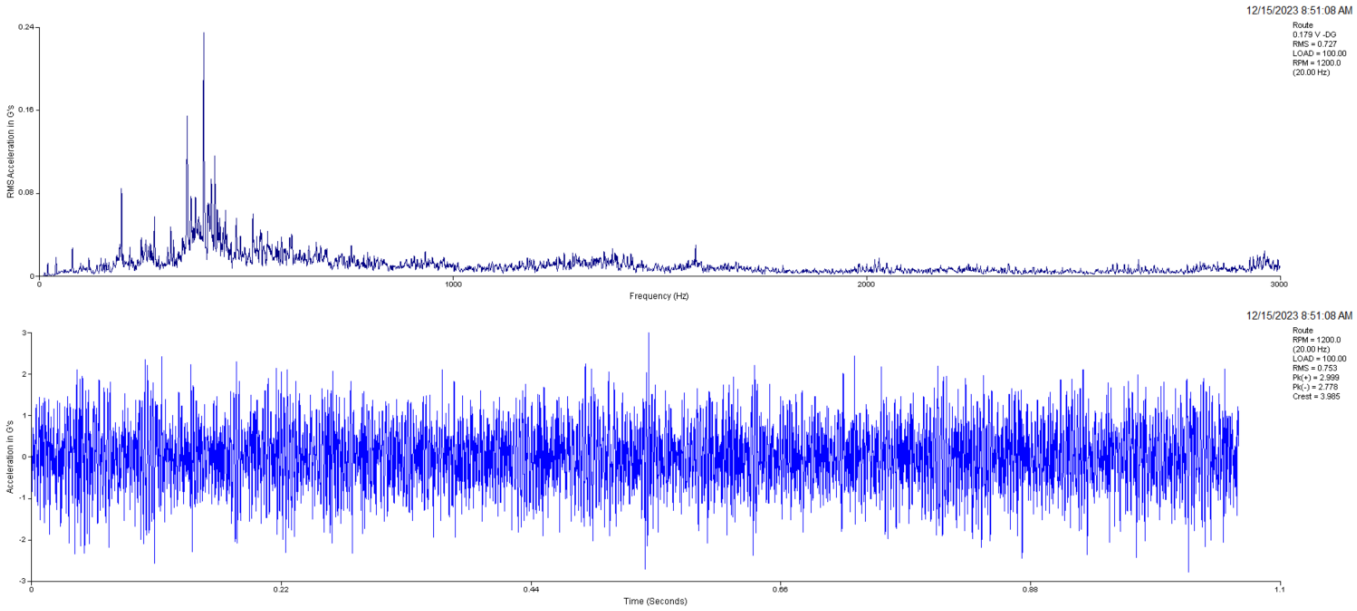
Pump 102 P102 CLASS I



Observation:
Data above is a multipoint spectral waterfall. Pump data shows a 2 x rpm peak with multiple pump rpm harmonics throughout the pump spectra.

Recommendation:
The pump appears to have possible internal wear beginning to occur. The higher vibration in the axial direction may indicate excessive axial clearances. We are monitoring this very closely.

C Concentrator Vacuum Pump CLASS I



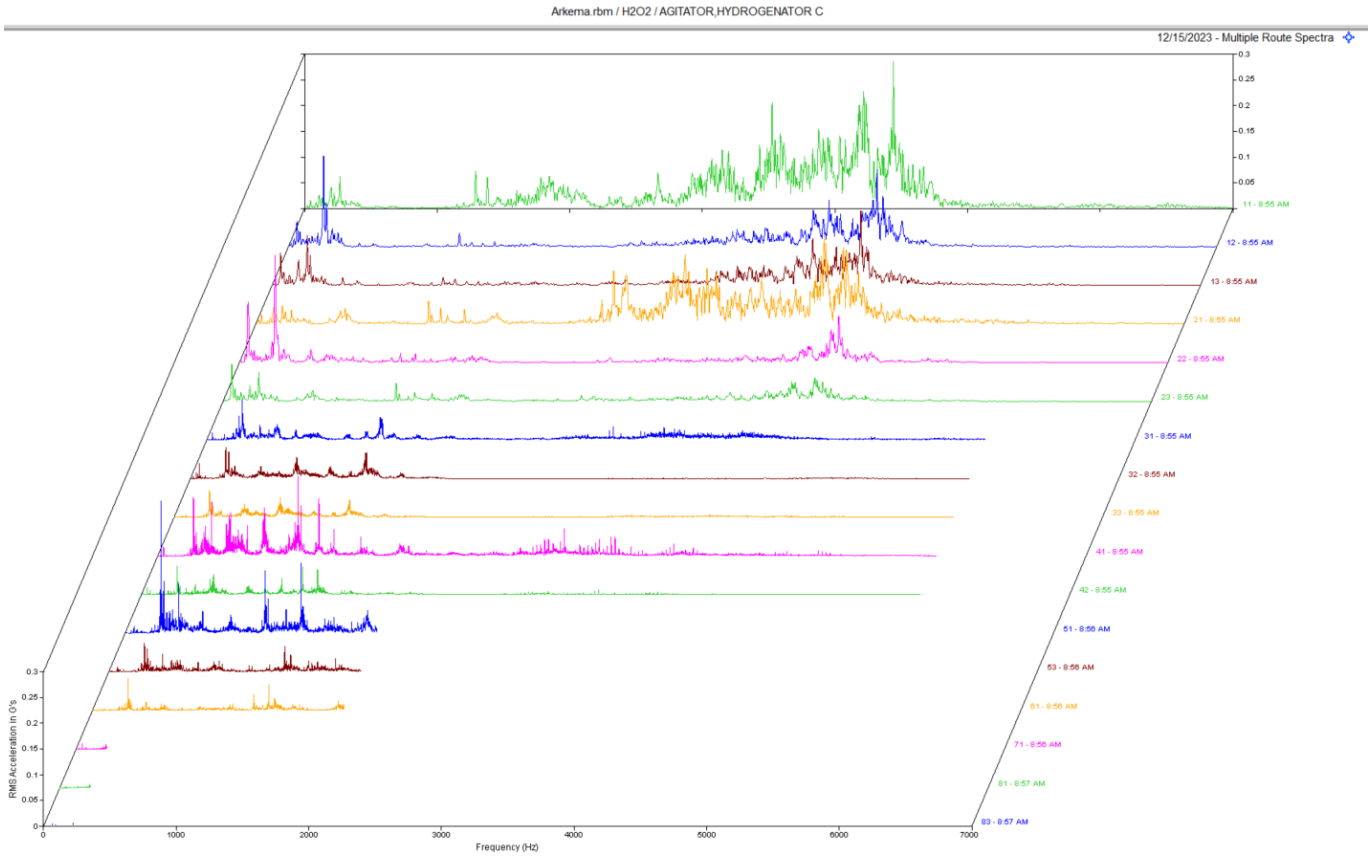
Observation:

Data above is the pump drive end horizontal. The small peaks in mid to high range of the spectrum are non-synchronous peaks and are very likely bearing defect frequencies.

Recommendation:

The pump appears to have early to mid-stage bearing defects/wear. We are monitoring this issue closely.

Agitator, Hydrogenator C CLASS I



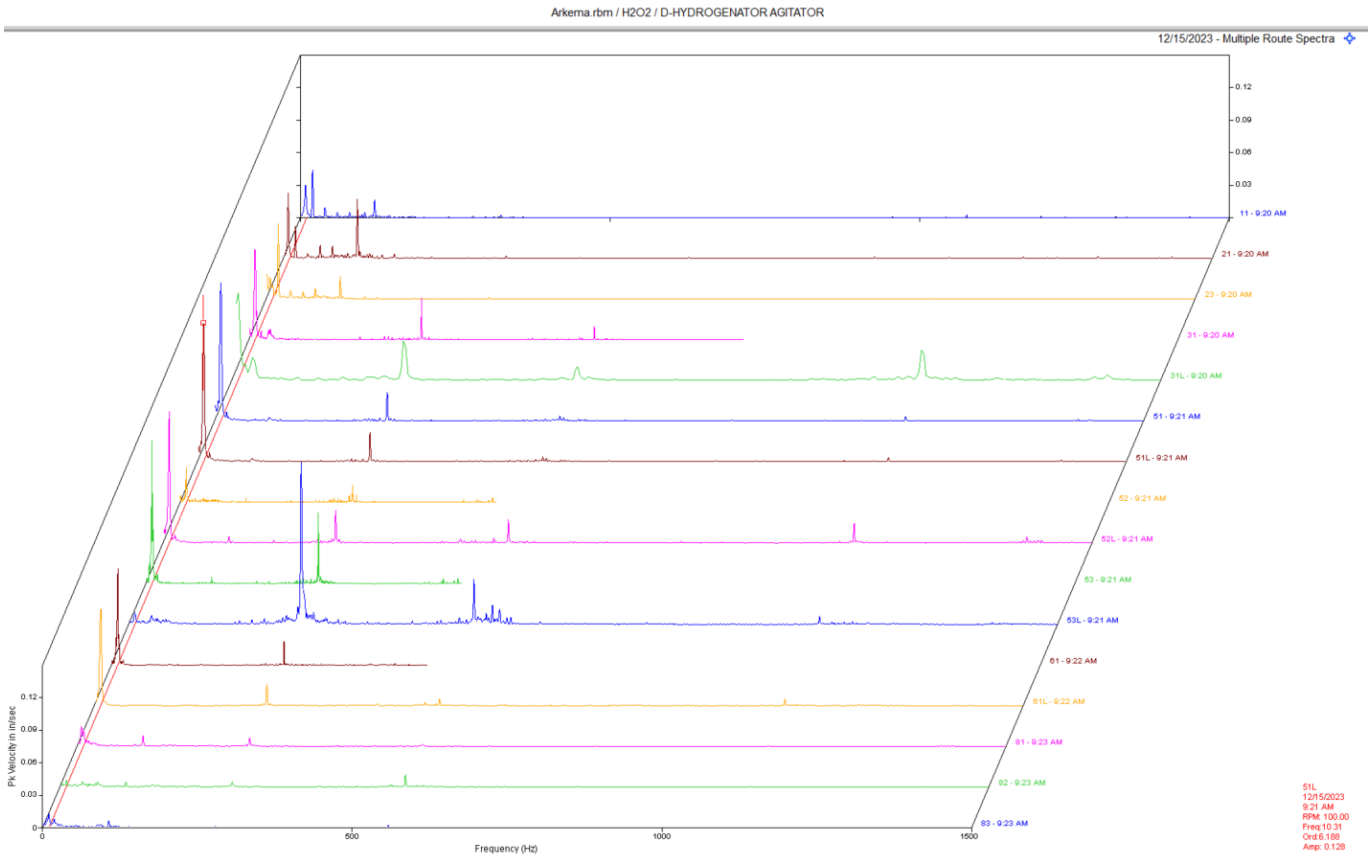
Observation:

Data above is a multipoint spectral waterfall. Data still shows some noise floor in the motor data. Data points labeled 11-23.

Recommendation:

Motor data still suggests a possible issue in the motor. May be rolling element defects in bearings. This issue appears to be minor at this time and we are monitoring this closely.

D Hydrogenator Agitator CLASS II



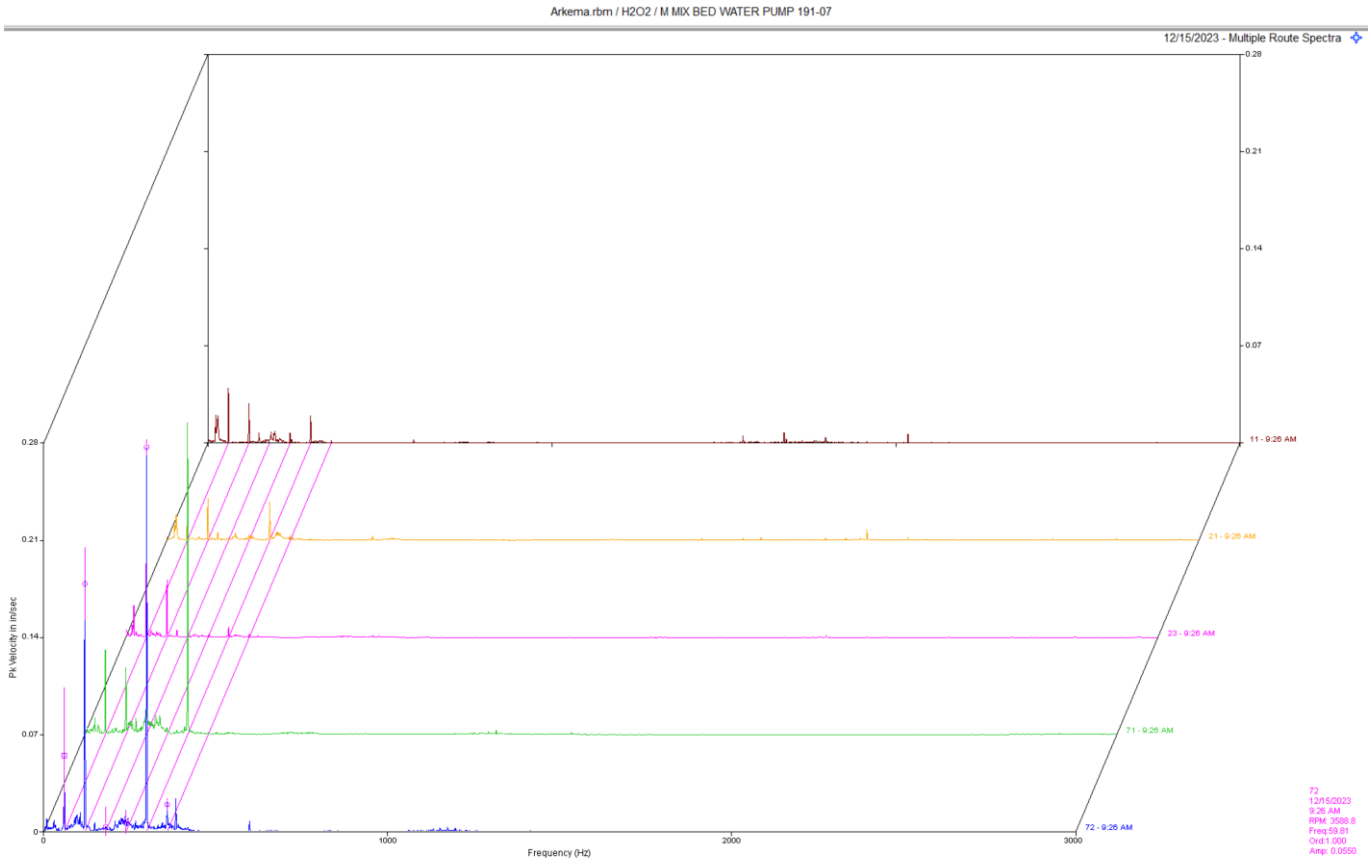
Observation:

Data above is a multi-point spectra of the motor and gear drive. There is quite a bit of low frequency vibration in the gear drive. Spectral and waveform data shows a dominant low frequency vibration that is likely a harmonic of output speed of the gearbox. Gearbox does appear to have visible torsional movement. There is also some gear mesh harmonics on the output axial that have increased in amplitude.

Recommendation:

Ensure output shaft does not excessive shaft defection. Check coupling hubs and shaft for run out using a dial indicator. Will continue to monitor closely.

Middle Mix Bed Water Pump 191-07 CLASS I



Observation:

Multi-point data shows some higher vibration in the pump particularly in the pump vertical direction. Data shows a high 2 x rpm and a 5 x rpm vibration in the pump vertical spectrum.

Recommendation:

Pump may have some process issues causing some vane pass vibration. The 2 x rpm vibration may be a coupling or shaft issue. Vibration amplitude in the pump verrtical is just at low alarm level. We are monitoring this closely.

Abbreviated Last Measurement Summary

****

Database: Arkema.rbm
Station: PEROXIDE
Route No. 2: ARK WK 2

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
P102 - ARKEMA PUMP P102	(15-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.135 In/Sec	.395 G-s
MOV	.128 In/Sec	.401 G-s
MIH	.120 In/Sec	.782 G-s
MIV	.170 In/Sec	.988 G-s
MIA	.156 In/Sec	.429 G-s
EIA	.391 In/Sec	.577 G-s
EIH	.277 In/Sec	3.034 G-s
EIV	.400 In/Sec	1.830 G-s
EOH	.247 In/Sec	1.815 G-s
EOV	.213 In/Sec	1.487 G-s
2130-1old - C Concentrator Vacuum Pump	(15-Dec-23)	
	OVERALL LEVEL	1-20 KHz
11	.057 In/Sec	.586 G-s
21	.069 In/Sec	.655 G-s
23	.095 In/Sec	.178 G-s
71	.139 In/Sec	2.159 G-s
81	.179 In/Sec	.530 G-s
83	.147 In/Sec	.737 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(15-Dec-23)	
	OVERALL LEVEL	1-20 KHZ
02	.040 In/Sec	.048 G-s
03	.037 In/Sec	.017 G-s
11	.076 In/Sec	1.809 G-s
12	.122 In/Sec	.830 G-s
13	.116 In/Sec	.664 G-s
21	.073 In/Sec	1.449 G-s
22	.214 In/Sec	.388 G-s
23	.127 In/Sec	.290 G-s
31	.085 In/Sec	.602 G-s
32	.094 In/Sec	.237 G-s
33	.059 In/Sec	.173 G-s
41	.102 In/Sec	.638 G-s
42	.066 In/Sec	.222 G-s
51	.124 In/Sec	.574 G-s
53	.051 In/Sec	.173 G-s
61	.038 In/Sec	.247 G-s
71	.045 In/Sec	.765 G-s
81	.022 In/Sec	.417 G-s
83	.032 In/Sec	.210 G-s
57 - A/B Concentr Vac Pmp-var RPM	(15-Dec-23)	
	OVERALL LEVEL	1-20 KHz
11	.051 In/Sec	.570 G-s
12	.059 In/Sec	.371 G-s
21	.099 In/Sec	.391 G-s
23	.060 In/Sec	.171 G-s
71	.162 In/Sec	.488 G-s
81	.209 In/Sec	1.468 G-s
83	.074 In/Sec	1.471 G-s

2130-1 - FLASH VAP VAC PUMP-var speed (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.069 In/Sec	.260 G-s
12	.050 In/Sec	.080 G-s
21	.043 In/Sec	.702 G-s
22	.047 In/Sec	.265 G-s
23	.051 In/Sec	.171 G-s
71	.078 In/Sec	.988 G-s
72	.088 In/Sec	.492 G-s
81	.085 In/Sec	1.993 G-s
82	.085 In/Sec	.734 G-s
83	.052 In/Sec	.534 G-s

C-203 - C-203 Comp (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.061 In/Sec	2.959 G-s
12	.029 In/Sec	.898 G-s
21	.066 In/Sec	2.723 G-s
22	.023 In/Sec	.260 G-s
23	.026 In/Sec	.299 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.080 In/Sec	4.877 G-s
72M	.047 In/Sec	1.168 G-s
73M	.072 In/Sec	.960 G-s
81M	.055 In/Sec	7.631 G-s
82M	.047 In/Sec	1.126 G-s
71F	.052 In/Sec	4.062 G-s
72F	.051 In/Sec	1.314 G-s
73F	.039 In/Sec	1.101 G-s
81F	.047 In/Sec	7.426 G-s
82F	.050 In/Sec	1.767 G-s

C-202 - C-202 Comp (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.213 In/Sec	7.283 G-s
12	.151 In/Sec	2.288 G-s
21	.078 In/Sec	1.491 G-s
22	.059 In/Sec	.650 G-s
23	.052 In/Sec	.504 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.062 In/Sec	4.089 G-s
72M	.053 In/Sec	1.087 G-s
73M	.095 In/Sec	.991 G-s
81M	.053 In/Sec	5.065 G-s
82M	.058 In/Sec	1.268 G-s
71F	.043 In/Sec	3.217 G-s
72F	.065 In/Sec	.894 G-s
73F	.040 In/Sec	.840 G-s
81F	.044 In/Sec	5.393 G-s
82F	.054 In/Sec	1.727 G-s

C-201 - C-201 Comp (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.130 In/Sec	3.776 G-s
12	.056 In/Sec	.840 G-s
21	.104 In/Sec	1.249 G-s
22	.040 In/Sec	.445 G-s
23	.059 In/Sec	.430 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.084 In/Sec	5.252 G-s
72M	.050 In/Sec	1.573 G-s
73M	.087 In/Sec	1.215 G-s
81M	.049 In/Sec	6.436 G-s
82M	.037 In/Sec	.934 G-s
71F	.038 In/Sec	4.842 G-s
72F	.074 In/Sec	1.902 G-s
73F	.039 In/Sec	1.191 G-s
81F	.048 In/Sec	8.422 G-s
82F	.076 In/Sec	1.883 G-s

new AC - INSTRUMENT AIR COMPRESSOR (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.098 In/Sec	1.074 G-s
12	.103 In/Sec	.687 G-s
13	.053 In/Sec	.230 G-s
21	.076 In/Sec	1.328 G-s
22	.077 In/Sec	.722 G-s
23	.037 In/Sec	.584 G-s
	OVERALL LEVEL	1-20 KHZ
71F	.117 In/Sec	6.371 G-s
72F	.091 In/Sec	2.061 G-s
73F	.069 In/Sec	2.464 G-s
81F	.141 In/Sec	4.481 G-s
82F	.140 In/Sec	1.797 G-s
83F	.288 In/Sec	1.980 G-s
71M	.105 In/Sec	6.920 G-s
72M	.096 In/Sec	2.943 G-s
73M	.104 In/Sec	1.922 G-s
81M	.188 In/Sec	9.184 G-s
82M	.347 In/Sec	3.299 G-s
83M	.333 In/Sec	1.711 G-s

201-08A - COMPRESSOR,NASH A 201-08A (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.057 In/Sec	.177 G-s
12	.077 In/Sec	.187 G-s
13	.133 In/Sec	.237 G-s
21	.055 In/Sec	.315 G-s
22	.035 In/Sec	.195 G-s
23	.041 In/Sec	.171 G-s
71	.158 In/Sec	.442 G-s
72	.132 In/Sec	.107 G-s
73	.229 In/Sec	.083 G-s
81	.115 In/Sec	.238 G-s
82	.189 In/Sec	.287 G-s
83	.172 In/Sec	.107 G-s

202-05 - NASH SEAL LIQUID PUMP-A (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.017 In/Sec	.219 G-s
21	.021 In/Sec	.381 G-s
23	.022 In/Sec	.061 G-s
71	.024 In/Sec	.031 G-s
72	.018 In/Sec	.010 G-s

9002-10 - D-HYDROGENATOR AGITATOR (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.067 In/Sec	.347 G-s
21	.097 In/Sec	.210 G-s
23	.089 In/Sec	.063 G-s
	OVERALL LEVEL	1-20 KHZ
31	.153 In/Sec	.778 G-s
31L	.112 In/Sec	.721 G-s
	OVERALL LEVEL	1-20 KHz
51	.189 In/Sec	.227 G-s
51L	.189 In/Sec	.227 G-s
52	.058 In/Sec	.366 G-s
52L	.156 In/Sec	.531 G-s
53	.220 In/Sec	.218 G-s
53L	.210 In/Sec	.240 G-s
61	.146 In/Sec	.180 G-s
61L	.135 In/Sec	.180 G-s
81	.038 In/Sec	.031 G-s
82	.026 In/Sec	.043 G-s
83	.030 In/Sec	.011 G-s

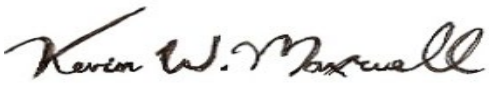
9003-01 - D-HYDRO PRIMARY FILT FD PUMP (15-Dec-23)

	OVERALL LEVEL	1-20 KHz
11	.029 In/Sec	.697 G-s
21	.040 In/Sec	.577 G-s

```
            23                        .031 In/Sec        .177 G-s
            71                        .102 In/Sec        .255 G-s
            72                        .174 In/Sec        .233 G-s

      9001-01     - D-HYDRO SECOND. FILT FD PUMP   (15-Dec-23)
                                    OVERALL LEVEL      1-20 KHz
            11                        .045 In/Sec        .423 G-s
            21                        .050 In/Sec        .567 G-s
            23                        .038 In/Sec        .298 G-s
            71                        .086 In/Sec        .380 G-s
            72                        .096 In/Sec        .224 G-s

      192-03      - Two Stage Water Pump A-WEST    (15-Dec-23)
                                    OVERALL LEVEL      1-20 KHz
            11                        .060 In/Sec        .638 G-s
            21                        .068 In/Sec        .533 G-s
            23                        .073 In/Sec        .285 G-s
            71                        .154 In/Sec        .794 G-s
            72                        .082 In/Sec        .370 G-s

      191-07      - M MIX BED WATER PUMP 191-07    (15-Dec-23)
                                    OVERALL LEVEL      1-20 KHz
            11                        .076 In/Sec        .636 G-s
            21                        .065 In/Sec       1.684 G-s
            23                        .093 In/Sec        .713 G-s
            71                        .255 In/Sec        .495 G-s
            72                        .365 In/Sec        .339 G-s

-------------------------------------------------------------------------------
   Clarification Of Vibration Units:
      Acc       -->  G-s       PK
      Vel       -->  In/Sec    PK
```

As always, it has been a pleasure to serve Arkema. If there are any comments or questions, do not hesitate to contact us.

Sincerely,



ISO Certified Vibration Analyst, Category III

HI-SPEED INDUSTRIAL SERVICE

QualiTest® Diagnostics

Cell: 901-486-4565

Email: kwilliam@gohispeed.com